Deploy Java Web Application on Docker Using Jenkins on AWS

This project demonstrates deploying a Java web application on a Docker container hosted on an AWS EC2 instance, fully automated using Jenkins CI/CD pipeline integrated with GitHub.

1. Setup Jenkins Server on AWS EC2
2. Setup & Configure Maven and Git
3. Integrate GitHub and Maven with Jenkins
4. Setup Docker Host
5. Integrate Docker with Jenkins
6. Automate Build and Deployment using Jenkins
7. Test the Deployment

Prerequisites:

- AWS Account
- Git/GitHub Account with source code
- Local machine with CLI access
- Familiarity with Docker and Git

Step 1: Setup Jenkins Server on AWS EC2

1. Launch a Linux EC2 instance (t2.micro recommended for free tier).
2. Select existing key pair or create a new one.
3. Configure Security Group:
   - Allow SSH (port 22)
   - Allow HTTP/Jenkins (port 8080)

4. Connect via SSH:

bash

ssh -i new3112.pem ec2-user@<public-ip>

5. Install Jenkins:

sudo wget -O /etc/yum.repos.d/jenkins.repo https://pkg.jenkins.io/redhat-stable/jenkins.repo

sudo rpm --import https://pkg.jenkins.io/redhat-stable/jenkins.io-2023.key

sudo yum install epel-release -y

sudo yum install java-11-openjdk-devel -y

sudo yum install jenkins -y

sudo systemctl enable jenkins

sudo systemctl start jenkins

6. Access Jenkins Web UI: http://<EC2_PUBLIC_IP>:8080

7. Unlock Jenkins using:

sudo cat /var/lib/jenkins/secrets/initialAdminPassword

Step 2: Integrate GitHub with Jenkins

1. Install Git:

sudo yum install git -y

git --version

2. Install GitHub plugin in Jenkins (Manage Jenkins → Manage Plugins → Available → GitHub Integration → Install without restart)

3. Configure Git in Jenkins (Manage Jenkins → Global Tool Configuration):

Name: Git

Path: /usr/bin/git

4. Save changes.

Step 3: Integrate Maven with Jenkins

1. Download and install Maven:

cd /opt

wget https://dlcdn.apache.org/maven/maven-3/3.9.5/binaries/apache-maven-3.9.5-bin.tar.gz

tar -xzf apache-maven-3.9.5-bin.tar.gz

2. Set environment variables in : sudo nano /etc/profile.d/maven.sh

export JAVA_HOME=/usr/lib/jvm/default-java

export M2_HOME=/opt/maven

export MAVEN_HOME=/opt/maven

export PATH=${M2_HOME}/bin:${PATH}

3.Install Maven Integration Plugin in Jenkins

4.Configure Java and Maven paths in Jenkins (Manage Jenkins → Global Tool Configuration)

Step 4: Setup Docker Host

1.Launch another EC2 instance for Docker (or use same if preferred)

2.Install Docker:

sudo yum install docker -y

sudo systemctl enable docker

sudo systemctl start docker

docker --version

3.Run basic Tomcat container:

docker run -d --name tomcat-container -p 8081:8080 tomcat

4.Copy content from webapps.dist to webapps:

docker exec -it tomcat-container /bin/bash

cp -R /usr/local/tomcat/webapps.dist/* /usr/local/tomcat/webapps

exit

5.Create custom Dockerfile:

FROM tomcat:latest

RUN cp -R /usr/local/tomcat/webapps.dist/* /usr/local/tomcat/webapps

Step 5: Integrate Docker with Jenkins

1.Create dockeradmin user and add to docker group:

sudo useradd dockeradmin

sudo passwd dockeradmin

sudo usermod -aG docker dockeradmin

2.Enable password authentication in /etc/ssh/sshd_config:

PasswordAuthentication yes

3.Reload SSH service:

sudo systemctl reload sshd

4.Install "Publish Over SSH" plugin in Jenkins (Manage Jenkins → Manage Plugins)

5.Add Docker host SSH credentials and configure Publish Over SSH.

Step 6: Jenkins Job to Build & Deploy to Docker

1.Create Jenkins job → configure to Poll SCM

2.Use Send files or execute commands over SSH post-build step

3.Example commands to build and run Docker container:

cd /opt/docker

docker build -t regapp:v1 .

docker run -d --name registerapp -p 8087:8080 regapp:v1

4.Trigger job automatically on GitHub commits.

Step 7: Update Dockerfile to Include WAR

```
FROM tomcat:latest

RUN cp -R /usr/local/tomcat/webapps.dist/* /usr/local/tomcat/webapps

COPY ./*.war /usr/local/tomcat/webapps
```

Build and run new image:

```
docker build -t tomcat:v1 .

docker run -d --name tomcatv1 -p 8086:8080 tomcat:v1
```

Access application: http://<DOCKERHOST_PUBLIC_IP>:8086/webapp/

Step 8: Automate End-to-End Deployment

Commit changes to GitHub → triggers Jenkins build → copies WAR to Docker host → builds Docker image → runs container

Example Exec command in Jenkins post-build:

```
cd /opt/docker

docker build -t regapp:v1 .

docker run -d --name registerapp -p 8087:8080 regapp:v1
```

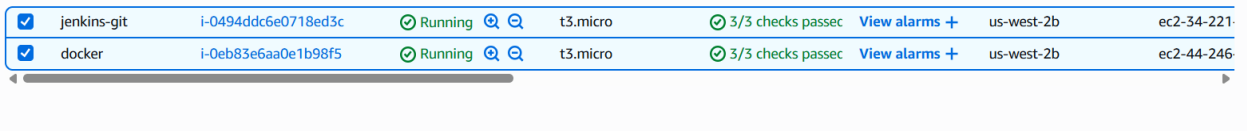
Access deployed app: http://<DOCKERHOST_PUBLIC_IP>:8087/webapp/

Conclusion

This project automates the full CI/CD pipeline for a Java web application using GitHub, Jenkins, Docker, and AWS EC2.

Output:

Ec2:



Jdk & mvn :

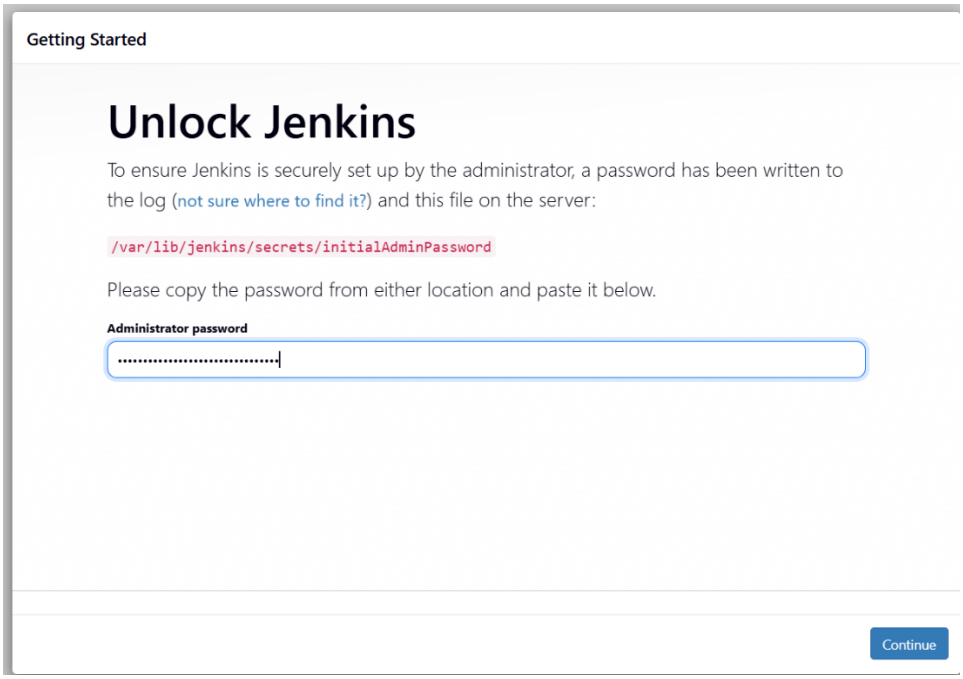
```
No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-34-2:~$ java -version
openjdk version "21.0.9" 2025-10-21
OpenJDK Runtime Environment (build 21.0.9+10-Ubuntu-124.04)
OpenJDK 64-Bit Server VM (build 21.0.9+10-Ubuntu-124.04, mixed mode, sharing)
ubuntu@ip-172-31-34-2:~$ wget https://dlcdn.apache.org/maven/maven-3/3.9.12/binaries/apache-maven-3.9.12-bin.tar.gz -P /tmp
--2025-12-31 06:26:53--  https://dlcdn.apache.org/maven/maven-3/3.9.12/binaries/apache-maven-3.9.12-bin.tar.gz
Resolving dlcdn.apache.org (dlcdn.apache.org)... 151.101.2.132, 2a04:4e42::644
Connecting to dlcdn.apache.org (dlcdn.apache.org)|151.101.2.132|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 9233336 (8.8M) [application/x-gzip]
Saving to: '/tmp/apache-maven-3.9.12-bin.tar.gz'

apache-maven-3.9.12-bin.tar.gz         100%[===================================================================================>]   8.80M  --.-KB/s    in 0.09s

2025-12-31 06:26:53 (101 MB/s) - '/tmp/apache-maven-3.9.12-bin.tar.gz' saved [9233336/9233336]

ubuntu@ip-172-31-34-2:~$ sudo tar xf /tmp/apache-maven-*.tar.gz -C /opt


ubuntu@ip-172-31-34-2:~$ sudo chmod +x /etc/profile.d/maven.sh
ubuntu@ip-172-31-34-2:~$ source /etc/profile.d/maven.sh
ubuntu@ip-172-31-34-2:~$ mvn -version
Apache Maven 3.9.12 (848fbb4bf2d427b72bdb2471c22fced7ebd9a7a1)
Maven home: /opt/maven
Java version: 21.0.9, vendor: Ubuntu, runtime: /usr/lib/jvm/java-21-openjdk-amd64
Default locale: en, platform encoding: UTF-8
OS name: "linux", version: "6.14.0-1015-aws", arch: "amd64", family: "unix"
ubuntu@ip-172-31-34-2:~$
```

Jdk & mvn Environmental path:

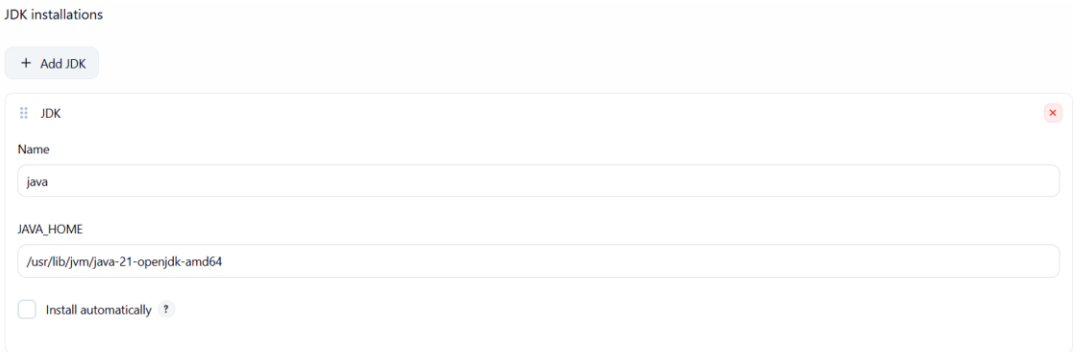
```
  GNU nano 7.2
export JAVA_HOME=/usr/lib/jvm/default-java
export M2_HOME=/opt/maven
export MAVEN_HOME=/opt/maven
export PATH=${M2_HOME}/bin:${PATH}
```

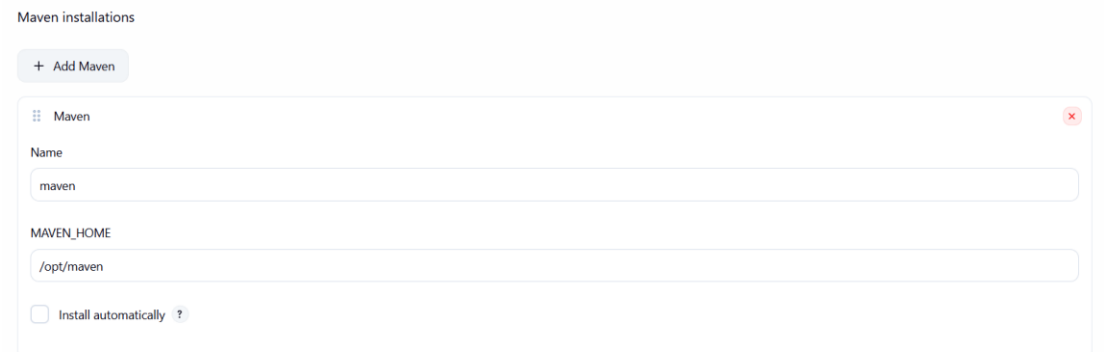
Jenkins:

```
ubuntu@ip-172-31-29-182:~$ sudo systemctl status jenkins.service
● jenkins.service - Jenkins Continuous Integration Server
     Loaded: loaded (/usr/lib/systemd/system/jenkins.service; enabled; preset: enabled)
     Active: active (running) since Fri 2026-01-09 07:45:29 UTC; 3min 40s ago
   Main PID: 543 (java)
      Tasks: 37 (limit: 1017)
     Memory: 394.2M (peak: 422.7M)
        CPU: 28.936s
     CGroup: /system.slice/jenkins.service
             └─543 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/java/jenkins.war --webroot=/var/cache/jenkins/war --httpPort=8080

Jan 09 07:45:26 ip-172-31-29-182 jenkins[543]: 2026-01-09 07:45:26.780+0000 [id=31]        INFO        jenkins.InitReactorRunner$1#onAttained: Started all >
Jan 09 07:45:26 ip-172-31-29-182 jenkins[543]: 2026-01-09 07:45:26.798+0000 [id=35]        INFO        jenkins.InitReactorRunner$1#onAttained: Augmented al>
Jan 09 07:45:27 ip-172-31-29-182 jenkins[543]: 2026-01-09 07:45:27.683+0000 [id=31]        INFO        h.p.b.g.GlobalTimeOutConfiguration#load: global time>
Jan 09 07:45:29 ip-172-31-29-182 jenkins[543]: 2026-01-09 07:45:29.599+0000 [id=34]        INFO        jenkins.InitReactorRunner$1#onAttained: System confi>
Jan 09 07:45:29 ip-172-31-29-182 jenkins[543]: 2026-01-09 07:45:29.600+0000 [id=34]        INFO        jenkins.InitReactorRunner$1#onAttained: System confi>
Jan 09 07:45:29 ip-172-31-29-182 jenkins[543]: 2026-01-09 07:45:29.744+0000 [id=30]        INFO        jenkins.InitReactorRunner$1#onAttained: Loaded all j>
Jan 09 07:45:29 ip-172-31-29-182 jenkins[543]: 2026-01-09 07:45:29.748+0000 [id=35]        INFO        jenkins.InitReactorRunner$1#onAttained: Configuratio>
Jan 09 07:45:29 ip-172-31-29-182 jenkins[543]: 2026-01-09 07:45:29.810+0000 [id=30]        INFO        jenkins.InitReactorRunner$1#onAttained: Completed in>
Jan 09 07:45:29 ip-172-31-29-182 jenkins[543]: 2026-01-09 07:45:29.847+0000 [id=24]        INFO        hudson.lifecycle.Lifecycle#onReady: Jenkins is fully>
```


Getting Started
Unlock Jenkins
To ensure Jenkins is securely set up by the administrator, a password has been written to the log (not sure where to find it?) and this file on the server:
/var/lib/jenkins/secrets/initialAdminPassword
Please copy the password from either location and paste it below.
Administrator password
Continue

Jdk & mvn path:


JDK installations
Add JDK
JDK
Name
java
JAVA_HOME
/usr/lib/jvm/java-21-openjdk-amd64
Install automatically



New Jenkins job:

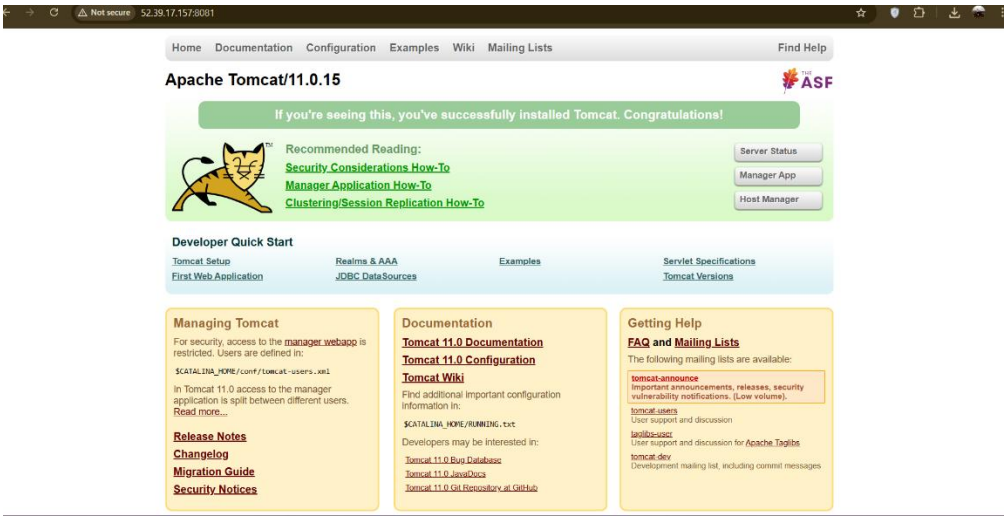
Docker:

```
ubuntu@ip-172-31-29-137:~$ docker info
Client: Docker Engine - Community
 Version:    29.1.3
 Context:    default
 Debug Mode: false
 Plugins:
  buildx: Docker Buildx (Docker Inc.)
    Version:  v0.30.1
    Path:     /usr/libexec/docker/cli-plugins/docker-buildx
  compose: Docker Compose (Docker Inc.)
    Version:  v5.0.1
    Path:     /usr/libexec/docker/cli-plugins/docker-compose

Server:
permission denied while trying to connect to the docker API at unix:///var/run/docker.sock
ubuntu@ip-172-31-29-137:~$
```

```
ubuntu@ip-172-31-29-137:~$ sudo su
root@ip-172-31-29-137:/home/ubuntu# cd ~
root@ip-172-31-29-137:~# docker ps
CONTAINER ID   IMAGE          COMMAND             CREATED          STATUS          PORTS                                        NAMES
a776a1ce0025   tomcat:v1      "catalina.sh run"   53 minutes ago   Up 53 minutes   0.0.0.0:8086->8080/tcp, [::]:8086->8080/tcp   tomcatv1
d65dfa09468b   1b6a1e45687e   "catalina.sh run"   2 hours ago      Up 2 hours      0.0.0.0:8087->8080/tcp, [::]:8087->8080/tcp   myapp
root@ip-172-31-29-137:~#
```

```
root@ip-172-31-29-137:~# docker images

IMAGE                ID             DISK USAGE   CONTENT SIZE   EXTRA
myapp:v1             94c31b175f3b       595MB          156MB    U
tomcat:latest        689475f36b76       587MB          157MB    U
tomcat:v1            152e9e8d29e8       595MB          156MB    U
tomcatserver:latest  4657211b6655       595MB          156MB    U
root@ip-172-31-29-137:~#
```

Tomcat :



User :

dockeradmin

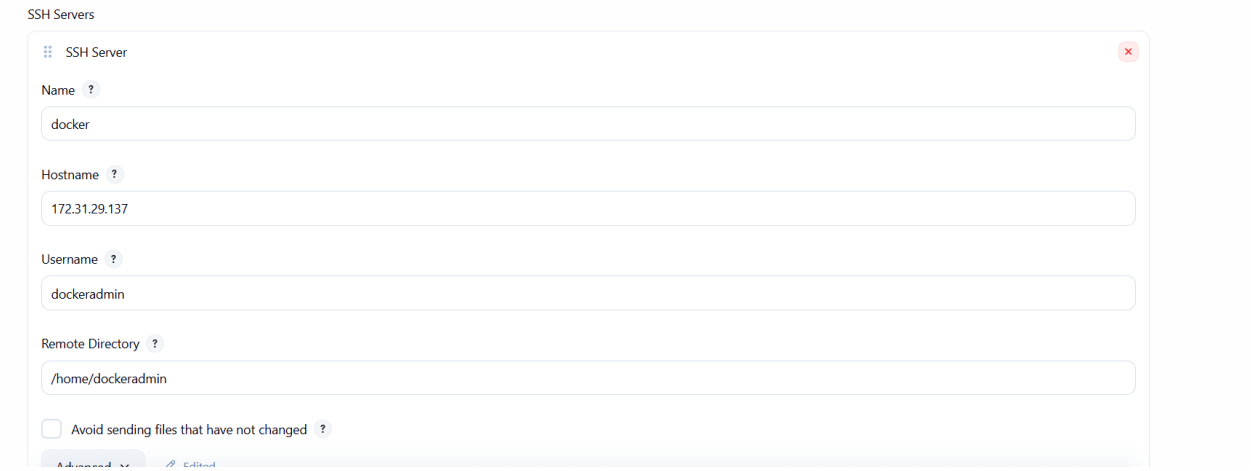
```
dockeradmin:x:1001:1001:Jagadish,5,9944258534,9944258534,other:/home/dockeradmin:/bin/bash
root@ip-172-31-29-137:/etc#
```

Now in order to access the server using the newly created User we need to allow password-based authentication. For that, we need to do some changes in the /etc/ssh/sshd_config file.

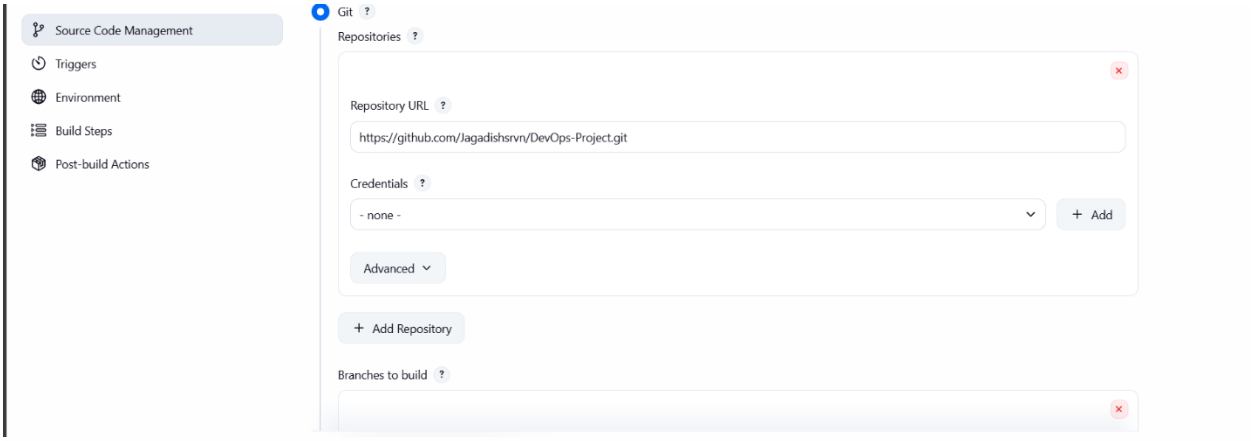
```
root@ip-172-31-29-137:~# vi /etc/ssh/sshd_config file.
```

```
# To disable tunneled clear text passwords, change to no here!
PasswordAuthentication yes
PubkeyAuthentication yes
KbdInteractiveAuthentication yes
ChallengeResponseAuthentication yes
UsePAM yes
#PermitEmptyPasswords no
```

Publish over SSH



Jenkins configure:



Triggers

Set up automated actions that start your build based on specific events, like code changes or scheduled times.

- [ ] Trigger builds remotely (e.g., from scripts)
- [ ] Build after other projects are built
- [ ] Build periodically
- [x] GitHub hook trigger for GITScm polling
- [ ] Poll SCM

Post-build Actions

Define what happens after a build completes, like sending notifications, archiving artifacts, or triggering other jobs.

Send build artifacts over SSH

SSH Publishers

SSH Server

Name

docker

Advanced

Transfers

Transfer Set

Source files

Project-1/hello-world/webapp/target/*.war

Remove prefix

Project-1/hello-world/webapp/target

Docker file:

```
root@ip-172-31-29-137:/opt/docker# cat Dockerfile
FROM tomcat:9.0
RUN cp -R /usr/local/tomcat/webapps.dist/* /usr/local/tomcat/webapps
COPY ./*.war /usr/local/tomcat/webapps/
root@ip-172-31-29-137:/opt/docker#
```

```
dockeradmin@ip-172-31-29-137:/opt/docker$ ls
Dockerfile  webapp.war
dockeradmin@ip-172-31-29-137:/opt/docker$
```